

## CLAIMS

What is Claimed is:

1. A method for applying a coating to an item, the coating consisting in major part of a combination of zinc and chromium, characterized by exposing the item to an aqueous solution comprising effective amounts of hydroxyl ions ( $\text{OH}^-$ ), Zn-containing ions, and Cr-containing ions and of rubidium ions ( $\text{Rb}^+$ ) in major part valence balancing the  $\text{OH}^-$ .
2. The method of claim 1 wherein:  
the amount of  $\text{Rb}^+$  is in excess of combined amounts of  $\text{Na}^+$  and  $\text{K}^+$  in the solution; and  
the Cr-containing ions are present in major part as Cr(VI) ions.
3. The method of claim 1 wherein:  
the amount of Rb is in excess of combined amounts of other alkali metals in the solution.
4. The method of claim 1 wherein the solution has a pH of at most 13.0.
5. The method of claim 4 wherein the solution has a pH of between 11.0 and 13.0.
6. A method for coating an item characterized by:  
exposing the item to an aqueous solution comprising effective amounts of:  
hydroxyl ions ( $\text{OH}^-$ );  
one or more ions of alkali metals, alkaline earth metals, or a combination thereof other than Na, to in major part valence balance the  $\text{OH}^-$ ;  
Zn-containing ions; and  
Cr-containing ions; and  
applying a current to the through the item effective to plate exposed portions of the item with a coating consisting in major part of a combination of Zn and Cr codeposited with a flake-like morphology.
7. A coated item manufactured by the method of claim 1.
8. A method for treating a metallic surface comprising:

exposing the surface to an aqueous solution comprising effective amounts of  $\text{Rb}^+$ , hydroxyl ions ( $\text{OH}^-$ ), Zn-containing ions and Cr-containing ions;

running a current through the surface so as to plate the surface with a coating consisting in major part of a combination of zinc and chromium.

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9. The method of claim 8 wherein:

a step of providing the solution comprises introducing the  $\text{Rb}^+$  in the solution as  $\text{RbOH}$ ; the amount of  $\text{Rb}^+$  is in excess of combined amounts of  $\text{Na}^+$  and  $\text{K}^+$  in the solution; and the Cr in the Cr-containing ions is present in major part as  $\text{Cr(VI)}$  ions.

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10. An aqueous electroplating solution for the codeposition of zinc and chromium comprising effective amounts of:

hydroxyl ions ( $\text{OH}^-$ );

one or more ions of alkali metals, alkaline earth metals, or a combination thereof other

15 than Na and K, to in major part valence balance the  $\text{OH}^-$ ;

Zn-containing ions; and

Cr-containing ions.

11. The solution of claim 10 consisting essentially of a solution of:

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5-1300 g/l  $\text{RbOH}$ ;

0.1-125 g/l  $\text{ZnO}$ ; and

0.1-50 g/l  $\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$ .

12. The solution of claim 11 further comprising an amount of ammonium

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hexafluorosilicate effective to stabilize the solution so as to substantially prevent zinc hydroxide precipitation over a period of at least 3 days.